Journal of Pharmacognosy and Phytochemistry
Available online at www.phytojournal.com

E-ISSN: 2278-4136
P-ISSN: 2349-8234
JPP 2017; 6(5): 446-449
Received: 05-07-2017
Accepted: 06-08-2017

Rakesh Singh
Department of Seed Science and Technology, Hemwati Nandan Bahuguna Garhwal University (a central university), Srinagar, Uttarakhand, India

Correspondence
Rakesh Singh
Department of Seed Science and Technology, Hemwati Nandan Bahuguna Garhwal University (a central university), Srinagar, Uttarakhand, India

Effects of hydro priming on seed germination and vigour of *Aegle marmelos*

Rakesh Singh

Abstract
In cultivation of medicinal trees, seed germination is very important problem. Various seed enhancements are being adopted now a day to improve seedling emergence. Among these seed enhancement, seed priming is an efficient and inexpensive method for increasing & improvement of seed vigour & germination and seedlings growth. The laboratory experiment was conducted at Department of Seed Science and Technology, Hemwati Nandan Bahuguna Garhwal University (a central university), Srinagar, Uttarakhand during 2015. The present study was conducted to examine the Effects of hydro priming, (24 and 48 h hydro priming) treatment along with control (Without any treatment) on seed germination and seedling quality character of bael (*Aegle marmelos*). The results showed that the effect of hydro priming was significant on seed germination percentage; seedling length, seedling vigour and dry matter production than control. Mean comparison showed that control that after 25 days and the maximum germination (91%), seedling length (15.71 cm), dry matter production (0.21gm), vigour index 1 (1143.53), and vigour index 2 (18.67).were achieved by hydro priming of bael seeds for 48 h. Hence bael seeds can be hydro primed for 48 h to improve the germiniability and vigour.

Keywords: Seed priming, germination, seedling vigour and bael

Introduction
Aegle marmelos (L.) Corr., is a popular medicinal tree belonging to the family Rutaceae and its various parts are used in Ayurvedic and Siddha medicines to treat a variety of ailments. The tree grows wild in dry forests of hills and plains of tropical and subtropical region of Central and Southern India, Burma, Pakistan, Bangladesh, Sri Lanka, Northern Malaya, and Java Islands (Islam *et al.*, 1995) ref [1]. Almost all parts of the tree are used in preparing herbal medicine (Kala, 2006) ref. [2]. The roots are useful for treating diarrhea, dysentery and dyspepsia.
The tree is rich in alkaloids, among which aegline, marmesin, marmin and marmelosin are the major ones. The compounds luvangetin and pyranocoumarin, isolated from seeds showed significant antiulcer activity (Goel *et al.*, 1997) ref. [4]. Essential oil isolated from the leaf has antifungal activity (Rana *et al.*, 1997) ref. [5].
The foundation for revitalization of local health traditions (FRLHT), Bangalore, India assessed threat status of bael *(A. marmelos*) tree as rare, endangered and threatened (RET) species, especially endangered species and importance is being given for mass multiplication through various propagation techniques. The tree is normally grown with seeds (Nayak and Sen, 1999). ref. [6].
Seed priming is an efficient method for increasing seed vigour and synchronization of germination, as well as the growth of seedlings of many crops under stressful conditions (Carvalho *et al*., 2011). Generally priming would cause an effective invigoration of the dry seed which is the inception of metabolic processes that normally occur during imbibition and which are subsequently fixed by drying the seed. (Hanson, 1973)
Priming advanced the radical emergence by following means

- Speed up the rate of water uptake.
- Eliminating the time necessary for the loosening of embryo cell wall.
- Permitting the completion of the first step of the endosperm weakening process.

Seed priming is known as the seed treatment which improves seed performance under environmental condition (Ashraf and Foolad, 2005). It is reported that seed priming is one of the most important development to help rapid and uniform germination and emergence of seeds and to increase seed tolerance to adverse environmental condition. Earlier works showed that the success of seed priming is influence by the complex interaction of different factors like water potentiality of the priming agent, priming time, temperature, seed vigor, dehydration,

and storage condition of the primed seed (Moradi Dezfuli *et al.,* 2008). Hydro primed seeds are conditioned to pre-determined moisture content using water, then a fully or partially dried to lower moisture content (Hegerty 1978). In the system, water availability may be highly-regulated or freely-available (Taylor *et al.,* 1998). The rate of water uptake is important in some large-seeded species (i.e. soybean or field beans) where rapid imbibitions may be injurious (Khan, 1992).

Hydro priming is a safe, simple and inexpensive method to enhance Germination. Most (>80%) farmers benefits of priming on early germination, establishment and yield and most (>95%) intended to prime in following years.

Although effect of seed priming in other field crops are documented, no reports are available on potential of various seed priming treatments and responses of the Bael seeds on subsequent exposure to drought stress.

The rate of seed germination and the final germination percentage as well as the amount of water absorbed by the seeds were considerably lowered with the rise of osmotic stress level.

Materials and Methods

The freshly ripped fruits of *Aegle marmelos* were collected from healthy well growing tree from Chaurash campus of HNBG University Srinagar in the month of may-June, 2014. Then the collected fruits were breakdown to remove the outer shell of fruits and to get the seeds. Removed seeds were macerated with water for 48 hours, to remove the pulp and after that seeds were dried properly at room temperature (25 $\pm 1^0$C) for 3-4 days.

Treatment Preparation

This study was performed in a randomized factorial method with 100 seeds of 4 replicates in Whatman No.1.filter paper prepared as per International Seed Testing Association (ISTA)and were sterilized with 1% $HgCl_2$ solution for five minutes followed by three times wash with double distilled water and were kept in germinator maintained at 25±2°C 25 days

1. For control 100 seed per replicate were put in to the Petri dishes containing Whatman No.1.filter paper and water was used as a wetting agent.
2. For hydro priming seeds were soaked in distill water for 24 and 48 hour at room temperature. Soaked seeds, 100 per replicate were transferred to Petri dishes containing Whatman No.1.filter paper.

During the process of germination, the seeds were observed for days to first germination and based on the germination observations taken on every day germination. After 25 days of germination period, seedlings were evaluated for germination based on normal seedling characters and the results were reported in percentage. Ten randomly selected normal seedlings were measured for the vigour parameters, after the final day of testing (the 25th day), percentage of germination, seedling strength index were calculated using the following formulas:

Final Germination Percentage (FGP)

We use the following formula to calculate the percentage of germination (Nicols, 1968).

$$\frac{S}{T} * 100$$

S: The number of germinated seeds.

T: Total number of seeds.

Seedling length (cm): Ten normal seedlings were selected randomly and measured the shoot & root length of them. The root and shoot length was measured from the tip of primary root to base of the hypostyle, and from the base of primary leaf to the base of hypostyle, respectively. Total length of seedling obtained by adding roots and shoots length.

Root length (cm)

Final count was observed on 25th day and normal seedlings were selected randomly and measured the root length of them. The root length was measured from the tip of primary root to base of the hypocotyls and the mean root length was expressed in centimetres.

Shoot length (cm)

Final count was observed on 25th day and normal seedlings were selected randomly and measured the shoot length of them. The shoot length was measured from the base of primary leaf to the base of hypocotyls and the mean shoot length was expressed in centimetres.

Seedling fresh and dry weight (gm)

Ten normal seedlings used for measuring the seedling length, initially fresh weight was taken and put in the butter paper bag and dried in a hot air oven, maintained at 70 ± 1ºC temperature for 24 hours. Then the seedlings were removed and allowed to cool in a desiccators for 30 minutes, the weighing was done in an electronic balance. The weights of dried samples were recorded and average of ten seedling dry weight in milligrams was recorded.

$$\text{Dry weight (\%)} = \frac{\text{Fresh weight} - \text{Dry weight}}{\text{Fresh weight}} \times 100$$

Vigor Index of Seedling

The vigour index of seedling was calculated by adopting the method suggested by (Abdul Baki & Anderson 1973) and expressed as whole number for each treatment by using the below formula.

A). Vigour Index-I

Vigour index-I was computed by using the following formula and expressed as whole number (Abdul & Baker, 1973).

Vigour Index-I = Germination (%) X Seedling length (cm)

Where, seedling length = Root length + Shoot length

B). Vigour Index-II

The Vigour index - II of seedling was calculated by adopting the method suggested by (Abdul-Baki & Anderson 1973), and expressed as whole number for each treatment by using the formula mentioned below.

Vigour index-II = Germination (%) X Seedling dry weight (mg)

Statistical analysis

Data recorded during the course of investigations were subjected to statistical analysis under Factorial Completely random block design by Snedecor and Cochram (1968). Valid conciliations were drawn after the determination of significance difference between the treatments, at 5 and 1 per cent level of probability. Critical difference was calculated in order to compare the treatment means.

Results and Discussion

Effect of seed hydro-priming showed faster germination than unprimed seeds. Seeds primed for 48 h and 24 h resulted in earlier emergence than control (without any treatment) 25 days after final count. (Table 1) Total germination percentage showed significantly higher germination in primed seeds than unprimed seeds.

Ghassemi *et al*. (2008) in lentil, Hosseein and Kasra (2011) in pungram seed reported improved germination rate, root weight compared to unprimed and chemo primed seed treatment. Therefore, optimal yield could be achieved by fast germination and uniform emergence on the nursery. This implies that hydro priming is the important factor to enhance germination, uniform emergence plants and resistance to unfavorable environmental factors that inherit seed germination (light, temperature and water).

Effect of seed hydro priming on the germination percentage of bael seedling (Table 1) showed significant effect of seed priming on the germination of bael sees with seed priming for 48 h which recorded significantly higher germination percentage (91%) than control (76.67%).This was due to hydration of seeds during which hydrolytic enzymes stored food materials into metabolically useful chemicals that resulted in growth of the embryo.

Priming may be helpful in reducing the risk of poor stand establishment under nursery conditions. Priming improved seed performance might be attributable in part to the decreased lipid peroxidation and increased antioxidative activities during seed imbibitions.

These resuls are in accordance with other researchers who reported improvement of germination percentage (Nadjafi *et al*., 2006). B. venudevan *et al*., (2013) also reported that, hydro primed seeds showed significant increase in germination performance. The resultant effect of priming depends on the adopted method and duration of treatment. Hydro priming is a simple method of priming treatment. It does not require any special technical equipment owing to the use of distilled water as priming medium. It is simple and inexpensive method of seed priming. Similarly, B. venudevan *et al*., (2013) also presented that hydro priming as a probably the cheapest priming method of seed priming.

Table 1: Effect of Hydro priming on germination percentage, seedling length and dry matter production in bael (*Aegle marmelos*)

Treatment	Germination %		Seedling length(cm)		Dry matter production (gm seedlings^{-10})	
	Mean	S.D	Mean	S.D	Mean	S.D
Control	76.67	4.163	14.04	.115	.19	.011
24hWater soaking	83.00	3.000	13.73	.413	.20	.002
48hWater soaking	91.00	1.000	15.71	.453	.21	.003

Table 2: Effect of Hydro priming on Vigour Index- I and Vigour Index- II in bael (*Aegle marmelos)*

Treatment	Vigour index I		Vigour index II	
	Mean	S.D.	Mean	S.D.
Control	1073.79	40.250	14.22	1.251
24hWater soaking	1143.53	67.639	16.55	.502
48hWater soaking	1429.44	34.679	18.67	.315

Seedling growth and vigour index

Effect of hydro priming on the growth of the bael seedlings showed significant effect of hydro priming on the seedlings length, dry matter production and vigour index (Table 2 and 3)

Significantly higher seedlings length (15.71) were recorded in seeds that were primed for 48 h than control seeds. Similarly, dry matter production (0.21gm) and vigour index –I (1429.44), vigour index-II (18.67) that was primed for 48 h were superior to the control. This could be due to hydro priming treatment which speeded up seedling emergence by dissolving the plant hormones as endogenous regulators (ethylene, auxin and cytokinins) before sowing in the soil (Satvir *et al*., 2002), similarly, reported by Brocklehurst and Dearman (2008) that seed priming is a pre sowing strategy for influencing seedling development by modulating pre-germination metabolic activity prior to emergence of the radical and generally enhancing germination rate and plant performance.

Conclusion

Based on the information obtained in this research work was found that the water soaking treatment for 48 hour and 24 hour was significantly increase the germination percentage, seedling weight & vigour indexes than control in *Aegle marmelos*. This information is uses by the indigenous society.

Reference

1. Ansari O, Azadi MS, Sharif-Zadeh F, Younesi E. Effect of Hormone Priming on Germination Characteristics and Enzyme Activity of Mountain Rye *Secale montanum* Seeds under Drought Stress Conditions. Journal of Stress Physiology & Biochemistry. 2013; 9(3):61-71.
2. Heikal MM, Shaddad MA, Ahmed AM. Effect of water stress and gibberellic acid on germination of flax, sesame and onion seed. Journal of Biol Plant. 1982; 24:124-129.
3. Mensah JK, Obadoni BO, Eroutor PG, Onome-Irieguna F. Simulated flooding and drought effects on germination, growth, and yield parameters of sesame *Sesamum indicum* L. Afr Journal of Biotechnol. 2006; 5(13):1249-1253.
4. Turk MA, Rahmsn A, Lee KDM, Tawaha. Seed germination and seedling growth of three lentil cultivars under moisture stress. Asian Journal Plant Sci. 2004; 3:394-397.
5. Yildirim E, Turan M, Guvenc I. Effect of foliar salicylic acid applications on growth, chlorophyll and mineral content of cucumber grown under salt stress. J of Plant Nut. 2008; 31:593-612.
6. Mori M, Di-Mola I, Quaglietta-Chiaranda F. Salt stress and transplant time in snap bean: growth and productive behavior. Inter J Plant Prod. 2011; 5:49-63.
7. Boursiac Y, Chen S, Luu DT, Sorieul M, Dries N, Maurel C. Early effects of salinity on water transport in Arabidopsis roots: molecular and Plant Biol. 2005; 16(2):440-450.
8. Shabala S. Salinity and programmed cell death: unravelling mechanisms for ion specific signalling. J Exp Bot. 2009; 60(3):709-712.
9. Demirkiran A, Marakli S, Temel A, Gozukirmizi N. Genetic and epigenetic effects of salinity on *in vitro* growth of barley. Genet Mol Biol. 2013; 36(4):566-570.
10. Abogadallah GM. Antioxidative defense under salt stress.

Plant Signaling and Behavior. 2010; 5(4):369-374.
11. Barasa SMA, Farooq M, Tabassum R. Physiological and biochemical aspects of seed vigor enhancement treatments in fine rice *Oryza sativa* L. Seed Science and Technology. 2005; 33:623-628.
12. Basra SMA, Afzal I, Hameed A, Rashid RA. Inducing salt tolerance in wheat by seed vigor enhancement techniques. International Journal of Agriculture and Biology. 2005; 2(1):173-179.
13. Botia P, Carvajal M, Cerda A, Martinez V. Response of eight Cucumis melo cultivars to salinity during germination and early vegetative growth. Agronomy. 1998; 18:503-513.
14. Sharafizad M, Naderi A, Siadat SA, Sakinejad T, Lak S. Effect of Salicylic Acid Pretreatment on Germination of Wheat under drought stress. Journal of Agricultural Science. 2013; 5(3):179- 199.
15. Tandon V, Thayil S. Saving medicinal plants in south India,plants talk. 1995; 2:16-17.
16. Purohit SS, Vyas SP. In: Aegle marmelos Correa. ex Roxb. Bael, medicinal plant cultivation. A Scientific Approach, Agrobios, Jodhpur. 2004, 280-285.
17. Sankar G, Garg KI. In: Nutritional value of some important fruits, Handbook of Horticulture, kitabistan, Allahabad. 1967, 37-41.
18. Parichas, Bael. Aegle marmelos Nature's most natural medicinal fruit, Orissa Rev. 2004, 16-17.
19. Omar A. Almaghrabi. Impact of Drought Stress on Germination and Seedling Growth Parameters of Some Wheat Cultivars. Science Journal of Life. 2012; 9(1):590-598.
20. Jaber A, Akbar AG, Hassan H, Hamid Reza Osmani R. Effect of Salinity and Temperature Interaction on Germination of Hyssop Hyssopus officinalis World Applied Sciences Journal. 2013; 22(7):1024-1031.
21. Mohammad Bijeh Keshavarzi H. The Effect of Drought Stress on Germination and Early Growth of Sesamum indicum Seedling's Varieties under Laboratory Conditions. International Journal of Agricultural Management & Development. 2012; 2(4):271-275.
22. Esfandiar F, Majid J, Shahrzad S, Rozita J. Effect of salicylic acid and seed weight on germination of Wheat CV. BC ROSHAN under different levels of osmotic stress. European Journal of Experimental Biology. 2012; 2(5):1680-1684.
23. Ganesh N Sharma, Susheel K, Dubey, Nitin S. Evaluation of germination power of *Aegle marmelos* seeds. Journal of Chemical and Pharmaceutical Research. 2011; 3(1):732-736.
24. Venudevan1 B, Srimathi P. Conservation of endangered medicinal tree bael Aegle marmelos through seed priming. Journal of Medicinal Plants Research. 2013; 7(24):1780-1783.